UNDERSTANDING RENEWABLE ENERGY
THE ENERGY OF TOMORROW

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Video Transcript

[TEXT: Young African Leaders Initiative Online Training Series]

[TEXT: Stephen Koopman, Research and Development Manager, Energy Center Council for Scientific and Industrial Research, South Africa]

[TEXT: Understanding Renewable Energy, The Energy of Tomorrow]

I'm Stephen Koopman from South Africa's Council for Scientific and Industrial Research, and this is "The Energy of Tomorrow."

In this lesson, we will take a brief look at the current state of electric power generation and explore the trends that are pointing us toward a very different future, relying much more heavily on clean, renewable energy.

Every country needs energy to fuel economic growth, and African countries are no exception. But while more than 13 percent of the world's population lives in sub-Saharan Africa, the region has less than 3 percent of the world's total power-generation capacity. When talking about the amount of power available in a country, we refer to the "installed generating capacity," which is the sum total of all power that could be produced by all of the country's power plants and power-generation facilities. Among sub-Saharan countries, only South Africa has enough installed generating capacity to provide its citizens a level of energy consumption comparable to the global average. But even here, there are millions of people living without regular access to electricity. So how can we provide all Africans with electricity and ensure we have the energy we need to grow our economies without increasing harmful greenhouse gas emissions? The answer may be right outside our windows.

The world has seen rapid growth in the development of renewable energy in recent years, particularly wind and solar. Technologies to harness energy from the wind and the sun have existed for centuries. But as nations become more concerned about the threat of climate change, they are turning increasingly to clean energy solutions. These renewable resources are rapidly becoming the energy of the 21st century. In 2015, nearly half of all new power-generation capacity installed worldwide came from wind and solar energy.

But can these renewable energy resources provide enough electricity to meet our needs? Let's see! A single large wind turbine, which converts wind energy to electricity, can provide enough energy to power more than 1,000 homes. And a single hectare of solar panels, which harness the power of the sun, can power 200 homes.

Let's look at South Africa's recent experience developing renewable energy resources to see what is possible.

In 2011, the South African government launched the Renewable Energy Independent Power Producers Procurement Program. This program allowed wind and solar energy companies to develop renewable generation facilities for the national power grid. As of 2016, more than 50 of those projects are already operational and generating more than 2 gigawatts of power for the grid. That's 2 billion watts — enough to provide energy to more than a million homes. Renewables now account for roughly 5 percent of South Africa's total generation capacity. When all of the projects that have been approved to date are completed, they will generate more than 6.5 gigawatts of power for the grid, more than tripling South Africa's current renewable generation capacity. And the government has committed to doubling that number again by 2025.

But what about the cost? It's a fair question.

Years ago, solar cells and wind turbines were very expensive. But as countries like the United States, Germany, Japan and China invested heavily in wind and solar capacity over the past two decades, improvements in technology and economies of scale have driven prices down dramatically. In just the past six years, the cost of solar photovoltaic panels has dropped 80 percent, and the cost of wind turbines has fallen by a third. That means more power for more people at a much lower cost.

How does this cost compare to other forms of energy?

To answer that question, we have to understand the Levelized Cost of Energy, or LCOE, for various energy sources. The LCOE for a new power-generation facility calculates all of the costs associated with the construction, operation and maintenance of the facility — including any fuel needed to operate it — and divides that by the amount of electricity it will generate over its lifetime. We end up with a cost per unit of electricity produced, which allows us to compare costs across various energy sources.

Currently in South Africa, the LCOE of a new wind farm is 62 cents per kilowatt hour. The LCOE of a new solar photovoltaic farm is also 62 cents. By comparison, the LCOE of a new coal plant in South Africa is 1 Rand 5 cents, while nuclear is estimated to be 1 Rand 17 cents. This means that wind and solar energy are below the current cost of electricity in South Africa. That is what we call "grid parity." Once an alternative energy source reaches grid parity, as wind and solar photovoltaics have here, there is no economic disadvantage to using it.

As you might guess, the LCOE of a specific power-generation facility depends on a lot of variables, not the least of which is the availability of the energy resource at a given location. If you have more sun and more wind, you will produce more power, and the unit cost will go down. This is where Africa is particularly fortunate. Coastal areas of South Africa, the Western Sahara Desert and the Horn of Africa have some of the highest sustained wind speeds in the world. And there is no other continent that is blessed with a greater abundance of solar radiation. Large parts of Africa receive more than 3,000 kilowatt hours of solar radiation per square meter each year. That's 20 times the amount of electricity the average sub-Saharan African currently uses in a year. With numbers like this, you can see the potential for a 21st-century energy revolution right here in Africa. It's a revolution that can create new business opportunities and generate thousands of new jobs, all while protecting the environment from harmful pollutants and greenhouse gas emissions.

So what's to stop us from going 100 percent renewable? We'll look at some of those challenges in the next lesson.

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